The Return of El Niño,
Our Summer Monsoon,
Recent Weather and Drought Conditions
and the
August-October 2012
Climate Outlook
For Colorado

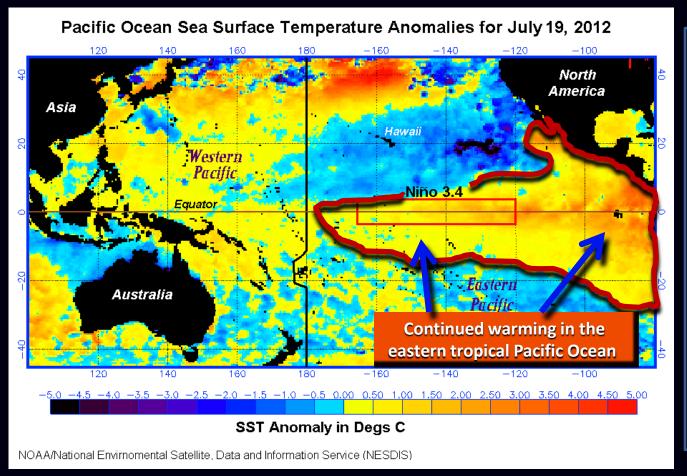
Mike Baker National Weather Service Boulder, Colorado July 23, 2012





El Niño Conditions Developing in the Pacific Ocean

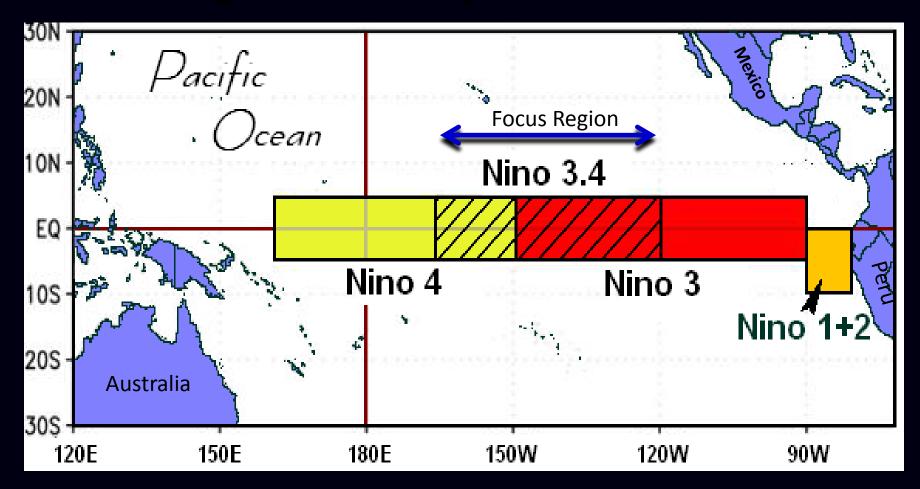
** El Niño Watch Has Been Issued **



During June, prevailing oceanic and atmospheric indicators continued to reflect the presence of weak ENSO-neutral conditions. However, in recent weeks positive equatorial sea surface temperatures (SSTs) have grown, exceeding 0.5°C across the eastern tropical Pacific. Other recent trends in sub-surface ocean temperatures and a gradual reversal in the equatorial wind and pressure field reflect a likely progression towards El Niño.

Across the eastern equatorial Pacific Ocean SSTs have continued to warm, with the greatest warming occurring adjacent to the west coasts of Central and South America where SSTs have risen in excess of 1.5°C above average as of the middle of July. Farther west within the region of the eastern Pacific known as Niño 3.4, SST anomalies varied from 0.3°C on its west side to 1.4°C at its eastern border.

Niño Regions in the Equatorial Pacific Ocean



Niño 3.4 – The principal region in the eastern Equatorial Pacific Ocean used by the Climate Prediction Center (CPC) for monitoring, assessing and predicting ENSO (hatched region on the above map).

The Oceanic Niño Index - ONI

Year	DJF	JFM	FMA	MAM	АМЈ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2000	-1.7	-1.5	-1.1	-0.9	-0.8	-0.7	-0.6	-0.5	-0.5	-0.6	-0.8	-0.8
2001	-0.7	-0.6	-0.5	-0.3	-0.2	-0.1	0.0	0.0	-0.1	-0.2	-0.2	-0.3
2002	-0.2	0.0	0.1	0.3	0.5	0.7	0.8	0.8	0.9	1.2	1.3	1.3
2003	1.1	8.0	0.4	0.0	-0.2	-0.1	0.2	0.4	0.4	0.4	0.4	0.3
2004	0.3	0.2	0.1	0.1	0.1	0.3	0.5	0.7	0.7	0.7	0.7	0.7
2005	0.6	0.4	0.3	0.3	0.3	0.3	0.2	0.1	0.0	-0.2	-0.5	-0.8
2006	-0.9	-0.7	-0.5	-0.3	0.0	0.1	0.2	0.3	0.5	0.8	1.0	1.0
2007	0.7	0.3	-0.1	-0.2	-0.3	-0.3	-0.3	-0.6	-0.9	-1.1	-1.2	-1.4
2008	-1.5	-1.5	-1.2	-0.9	-0.7	-0.5	-0.3	-0.2	-0.1	-0.2	-0.4	-0.7
2009	-0.9	-0.8	-0.6	-0.2	0.1	0.4	0.5	0.6	0.7	1.0	1.4	1.6
2010	1.6	1.4	1.1	0.7	0.2	-0.3	-0.8	-1.2	-1.4	-1.5	-1.5	-1.5
2011	-1.4	-1.3	-1.0	-0.7	-0.4	-0.2	-0.2	-0.3	-0.6	-0.8	-1.0	-1.0
2012	-0.9	-0.7	-0.5	-0.3	-0.1							

NOAA/CPC Last Update 07-05-12

An ONI of -0.1 indicates ENSO neutral conditions during the 3-month climate season of APR-MAY-JUN, 2012.

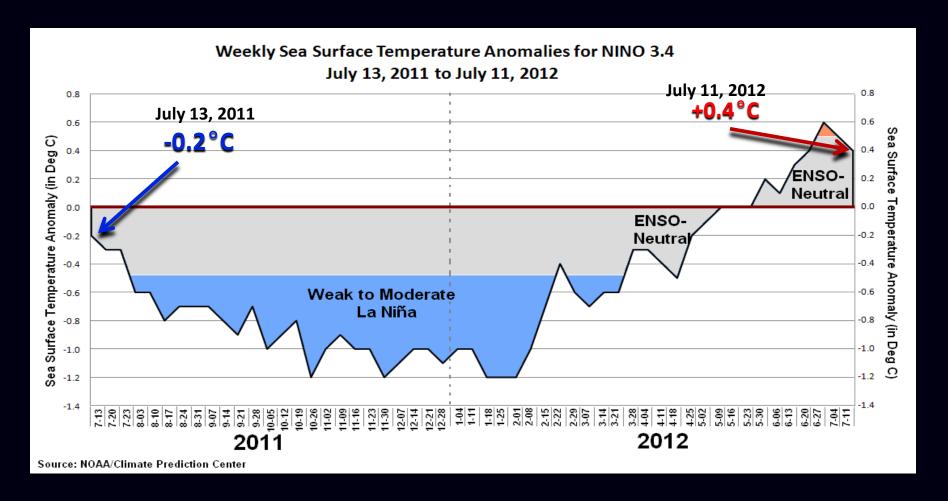
El Niño: ONI higher than +0.45 Neutral ENSO: ONI of -0.45 to +0.45 La Niña: ONI lower than -0.45 The ONI is based on sea surface temperature (SST) departures from average in the Niño 3.4 region of the eastern tropical Pacific Ocean. It is the principal measure used by NOAA's Climate Prediction Center (CPC) for monitoring, assessing and predicting El Niño/Southern Oscillation (ENSO.)

ONI is defined as the three-month running mean SST departures in the Niño 3.4 region of the Pacific.

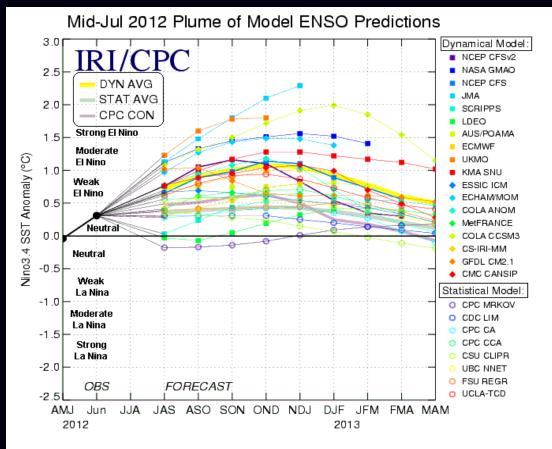
ONI is used to place current ENSO and non-ENSO events into a historical perspective.

CPC's operational definitions of El Niño and La Niña are keyed to the ONI index.

For historical purposes, warm and cold phases of ENSO (the red and blue colored numbers) are defined when the threshold is met for a minimum of 5 consecutive overlapping 3-month seasons.



Since early February of 2012, the weekly SST anomaly for Niño 3.4 region has exhibited a positive or upward trend. As of the week of July 11, 2012, the SST anomaly was +0.4°C. This is up from 0.0°C nearly a month ago, but down from a high of +0.6°C during the previous week of July 4, 2012.



Forecast SST Anomalies (deg C) in the Niño 3.4 Region

Seasons (2012-2013) JAS ASO SON OND NDJ DJF JFM FMA MAM

Average, Dynamical Models	0.7	0.9	1.0	1.1	1.0	0.9	0.8	0.6	
Average, Statistical Models	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.2	0.1
Average, All Models	0.6	0.7	8.0	0.9	8.0	0.7	0.6	0.4	0.3

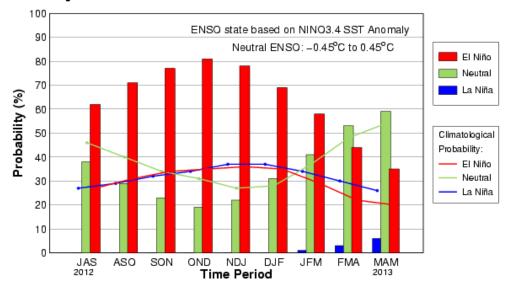
Source: The International Research Institute for Climate and Society (IRI) Latest Update: 7-19-21

The ENSO Outlook

Fifteen out of a total of the 18 dynamical models predict at least a weak El Niño (an average SST anomaly of 0.9°C) by the ASO 2012 climate season, and possibly a moderate El Niño by the SON 3-month climate season.

Only three of the eight statistical models make a similar prediction for this time period. The remaining statistical models outlook a continuation of neutral ENSO conditions through the winter season of 2012-2013.

Mid-July IRI/CPC Plume-Based Probabilistic ENSO Forecast



IRI Probabilistic ENSO Prediction for NINO3.4 Region

Season	La Niña	Neutral	El Niño
JAS	~ 0%	38%	62%
ASO	~ 0%	29%	71%
SON	~ 0%	23%	77%
OND	~ 0%	19%	81%
NDJ	~ 0%	22%	78%
DJF	~ 0%	31%	69%
JFM	1%	41%	58%
FMA	3%	53%	44%
MAM	6%	59%	35%

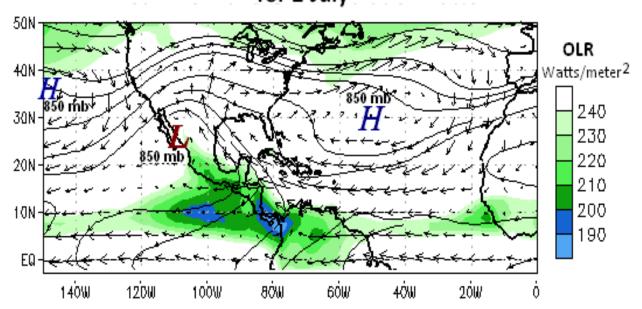
Last Update: July 19, 2012

The latest plume-based probabilistic ENSO forecast from IRI/CPC indicates virtually no chance of a La Niña for the remainder of 2012.

The model forecast does indicate a high probability of an El Niño this fall and winter (77% in SON, 81% in OND, 78% in NDJ and 69% in DJF), and an eventual return to neutral ENSO conditions by the spring of 2013.



Early Stage of the North American Monsoon Mean Flow and OLW Radiation Pattern for 2 July



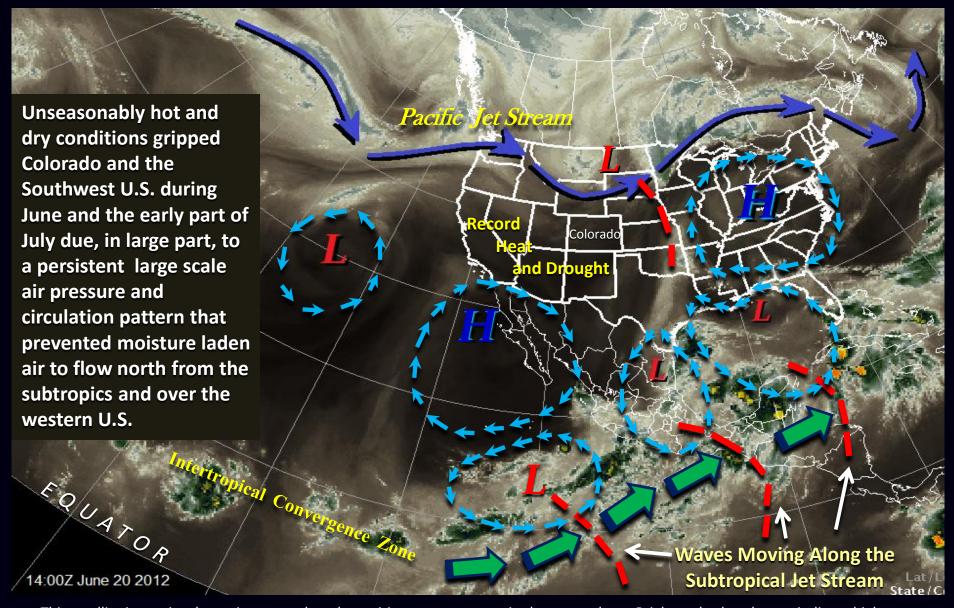
200 millibar Streamlines, 850 millibar Wind and Dominant Pressure Centers, and Outgoing Longwave Radiation (OLR) Climatology (1979-1995)

Data Sources: OLR - NESDIS/ORA, Winds - NCEP CDAS/ Reanalysis

The North American Monsoon

The North American Monsoon, also referred to as the Southwest U.S. Monsoon, is not as strong nor as persistent as its Indian counterpart, but it shares many of its basic traits.

The monsoon is not only a shift in the seasonal wind pattern across Mexico and the southwest U.S., it also involves a dramatic shift from the extremely dry and hot weather of June to the heavy convective rains and higher humidity of July and August.



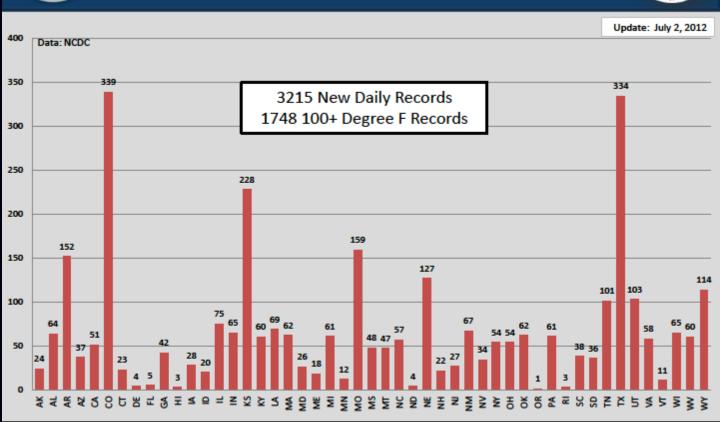
This satellite image is taken using a wavelength sensitive to water vapor in the atmosphere. Bright and colored areas indicate high water vapor (moisture) content; colored and white areas indicate the presence of both high moisture content and/or ice crystals. Black and brown areas indicate little or no moisture present. Water vapor imagery is useful for both determining locations of moisture and atmospheric circulations.

Was It Really That Hot This Past June? How Colorado Compared to Other States



Record Daily High Temperatures Nationwide - June 2012

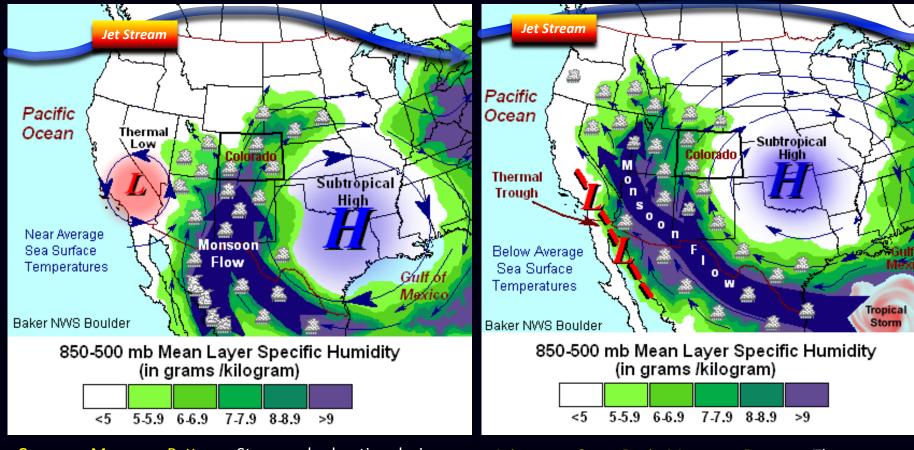




National Climatic Data Center

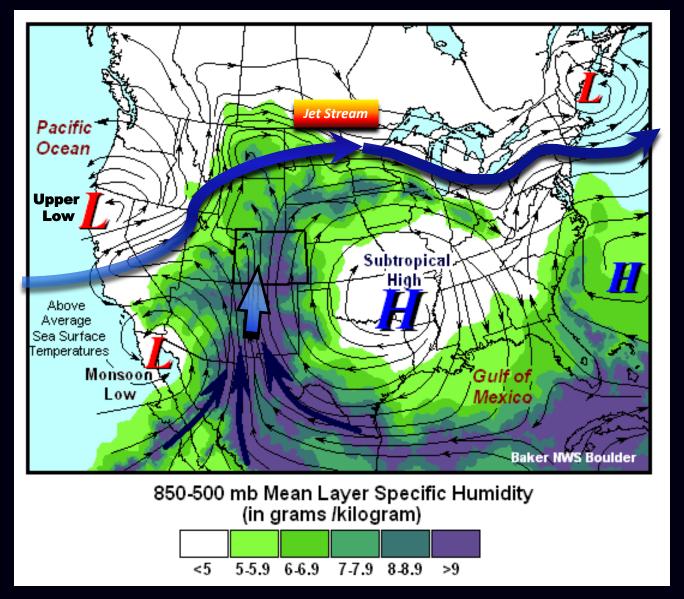
Total Number of Records

Alternating Appearance of the Summer Monsoon



Common Monsoon Pattern: Strong solar heating during June generates a thermal or heat low residing over the desert southwest. Circulation around this cyclone and the strong subtropical high pressure that often forms over the southern Great Plains during the summer sends moist and unstable subtropical air up into Arizona and New Mexico usually by the end of June. This plume of moisture will then travel northward along the spine of the Colorado Rockies stimulating thunderstorm formation along the way.

Arizona or Great Basin Monsoon Pattern: The strong subtropical high pressure ridge that forms over the Great Plains during the summer will periodically shift westward causing the monsoon moisture plume to track over the Great Basin. The result is a dramatic increase in thunderstorm activity for the desert southwest and intermountain region, and a substantial reduction in thunderstorm formation east of the Continental Divide. This pattern more often appears during La Niña conditions.



This enhanced monsoon pattern more often appears during or just prior to an El Niño.

Enhanced North American Monsoon Pattern

An enhanced summer monsoon pattern can persist for several days if not weeks at a time and affect much of the western continental U.S. Broad circulation around a strong, nearly stationary subtropical high pressure ridge centered over the southern Great Plains unites with unusually strong southwest flow aloft around an upper level trough positioned along the west coast. This deep layer circulation draws a multiprong plume of unusually moist and unstable subtropical air north from the Gulf of California, the high Mexican Plateau and the Gulf of Mexico. Under optimum conditions this enhanced circulation may fuel heavy rain producing thunderstorms as far north as Montana and the Dakotas.

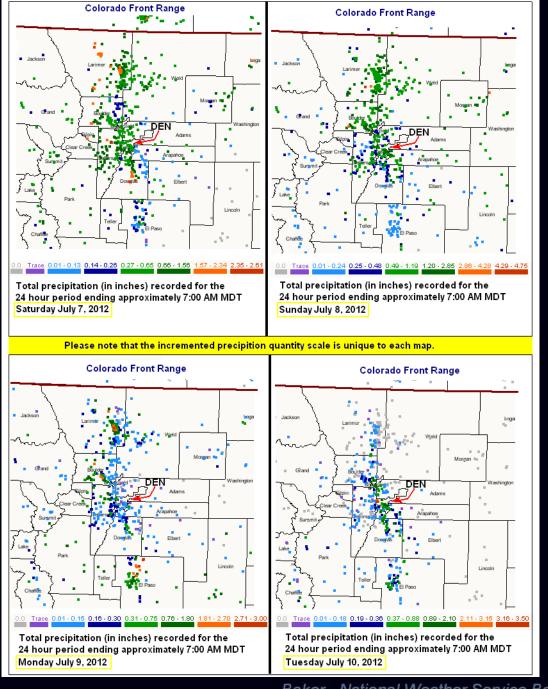
DEN **Subtropical Moisture** (Water Vapor) 6 PM MDT Sat July 7, 2012

GOES Infrared Water Vapor Satellite Image

First Brush with the Southwest Monsoon

A steady flow of moisture rich subtropical air streamed northeastward over Colorado during the four day period of July 6-9, 2012.

The initial arrival of this moisture was accompanied by a weak upper level weather disturbance that provided additional lift and shear to produce numerous slow moving thunderstorms in the mountains and on the plains of north central and northeast Colorado.



Daily precipitation amounts observed across north central Colorado during this four day period of monsoon thunderstorms varied widely from a trace at many locations on the plains and high mountain valleys, to over 4 inches at a number of reporting sites on and near the east slope of the Front Range.

Friday, July 6th and Saturday, July 7th saw the greatest number of heavy rain producing thunderstorms. Slow moving storms continue to form over and along the Front Range during the next two days. However, the area witnessed a gradual decrease in rainfall intensity as the plume of subtropical moisture thinned as it began to tilt eastward away from the Front Range.

Source of precipitation maps: Community Collaborative Rain, Hail and Snow Network (CoCoRaHS), Colorado Climate Center, Colorado State University

Baker - National Weather Service Boulder, Colorado

A highly charged monsoon thunderstorm drifting northward along the Front Range foothills west of Denver

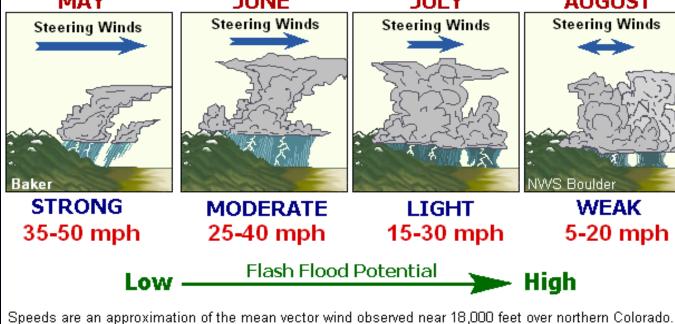


Heavy rainfall from slow moving thunderstorms during this four day visit of the monsoon caused numerous creeks and streams across northeast Colorado to run high and fast, and roadways to flood in many urban areas.

Flash flooding (heavy debris flow) along highway 14 near the High Park Burn Scar west of Fort Collins

Cloud bursts also caused areas of flash flooding, heavy debris flows and rock slides. The Front Range foothills saw most of this storm activity, particularly in steeply sloped terrain recently scorched by wildfire.

Seasonal Change in the Steering Winds Aloft Their Influence on Thunderstorm Movement and the Potential for Flash Flooding MAY JUNE Steering Winds Steering Winds Steering Winds Steering Winds



The
Flash
Flood
Potential

The potential for flash flooding along the Colorado Front Range due to heavy rainfall from thunderstorms peaks, on average, during late July and early August. During this time of year, often referred to as the *monsoon season*, steering winds aloft are normally quite weak and variable in direction and the moisture or water vapor content of the atmosphere is generally quite high. The risk of flash flooding typically decreases after the middle of August due to a steady reduction in the precipitable water present in the lower atmosphere.

Influence of Slope and Vegetation on Rainfall Runoff







inches per hour

In addition to the forward speed of a thunderstorm and the frequency of storms passing over a given location, other factors play an instrumental role in the production of flash floods. They include the degree of slope of the terrain, the type and amount of vegetation covering the ground, and the soil's ability to readily absorb water.

Baker - NWS Boulder



Always remain alert for the possibility of *flash flooding* in Colorado during the summer, particularly on steeply sloped terrain and in areas recently scorched by wildfire. Thunderstorms can form suddenly over ridge tops miles away without your knowledge, while you stand under a clear sky. At the first sign of rapidly rising water, don't hesitate, quickly climb to safety!

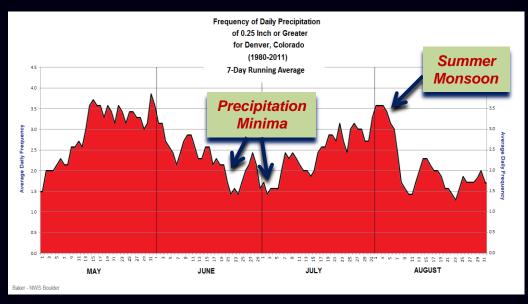


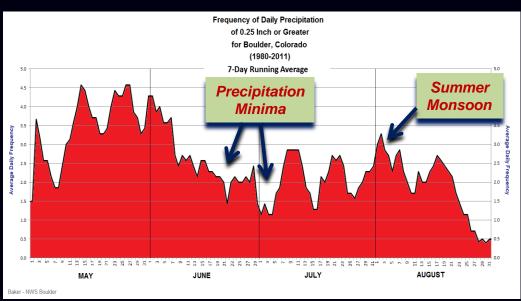
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Another Visit From the Monsoon

This Infrared water vapor satellite image, taken at 6:15 PM MDT, Monday July 23, 2012, reveals the southwest monsoon gaining strength as indicated by extensive thunderstorm formation (bright colors inside the circle depicting very cold cloud tops) over the steep slopes of the Sierra Madre Occidental mountain range in northwest Mexico.

Subtropical moisture (water vapor) carried aloft by southerly transport winds can be seen streaming north over Utah and western Colorado, and extending as far away as northern Montana and the upper Mississippi River Valley.

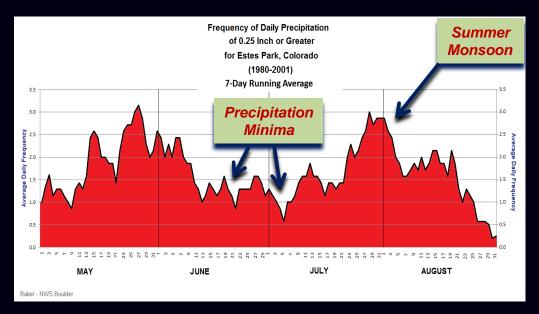


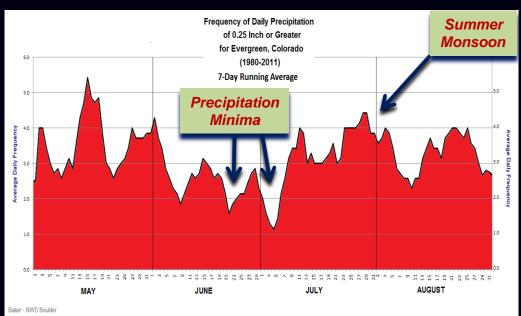


For Denver and Boulder, Colorado...

The probability of daily precipitation of at least 0.25 inch peaks, on average, in late May and early June and again in late July and early August during the period often referred to as the *summer monsoon*. During this later period of increased thunderstorm activity, the likelihood for intense rainfall and *flash flooding* is greater than just about any other time of the year, due in large part to very slow moving thunderstorms.

A precipitation minima is evident on these plots in early summer (late June and early July) at both locations. This period of comparatively dry weather is often accompanied by some of the warmest temperatures of the summer.



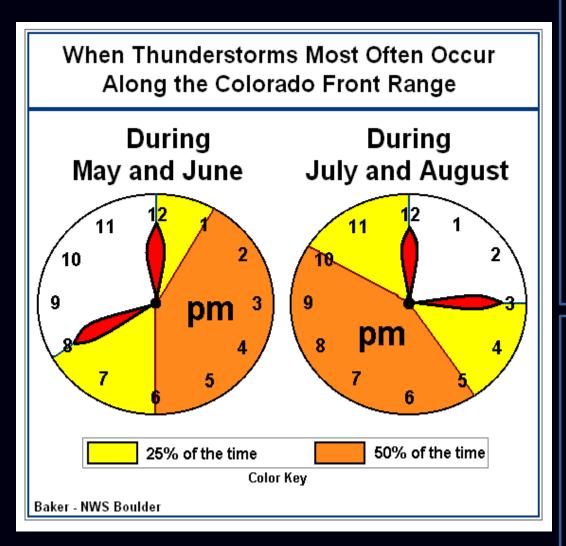


For the Front Range Foothill Communities of Estes Park and Evergreen, Colorado...

The probability of daily precipitation of at least 0.25 inch peaks, on average, in mid to late May, and in late July and early August for both foothill locations.

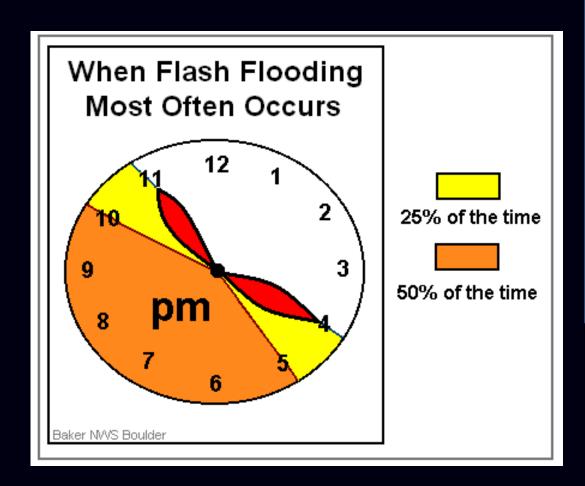
This mid-summer spike in precipitation frequency is largely the result of a marked increase in thunderstorms during the *summer monsoon*.

A precipitation minima is visible on these plots in early summer (mid June-early July) at both locations. This period of comparative dryness is often accompanied by some of the warmest temperatures of the summer. It is not uncommon to see a marked increase in wildland fire danger during this period.



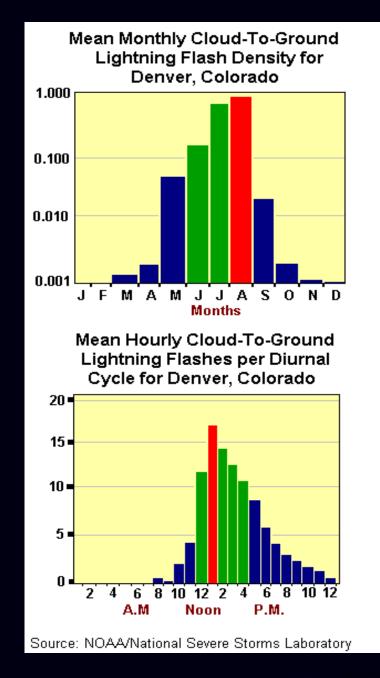
During May and June - Thunderstorms generally form first over the sun drenched east facing slopes of the Front Range by early afternoon. Because of the relatively strong winds aloft at this time of year, storms move quickly off the Front Range and over the nearby plains. Moving off the high terrain, they often initiate new storm development along outflow boundaries. Thunderstorms, particularly those during June, are more likely to produce large hail and strong damaging winds and are less likely to produce heavy rainfall due to their fast movement.

During July and August - Thunderstorms are more likely to appear over the Front Range and on the adjacent high plains of northeast Colorado during the late afternoon and evening hours. Because of light steering winds aloft normally present during this time of year, storms tend to linger over an area longer and are more incline to produce significant rainfall in a short period of time. Whereas, they are less likely to produce hail and damaging wind.



Flash Flooding - Thunderstorms, especially those associated with the summer monsoon, are more apt to generate intense rainfall resulting in flash flooding. The potential for flash flooding along and east of the Colorado Front Range is greatest during the late afternoon and evening hours. It is during this time of day when the amount of precipitable water normally peaks and when storm cells will often cluster together due to light and variable winds.



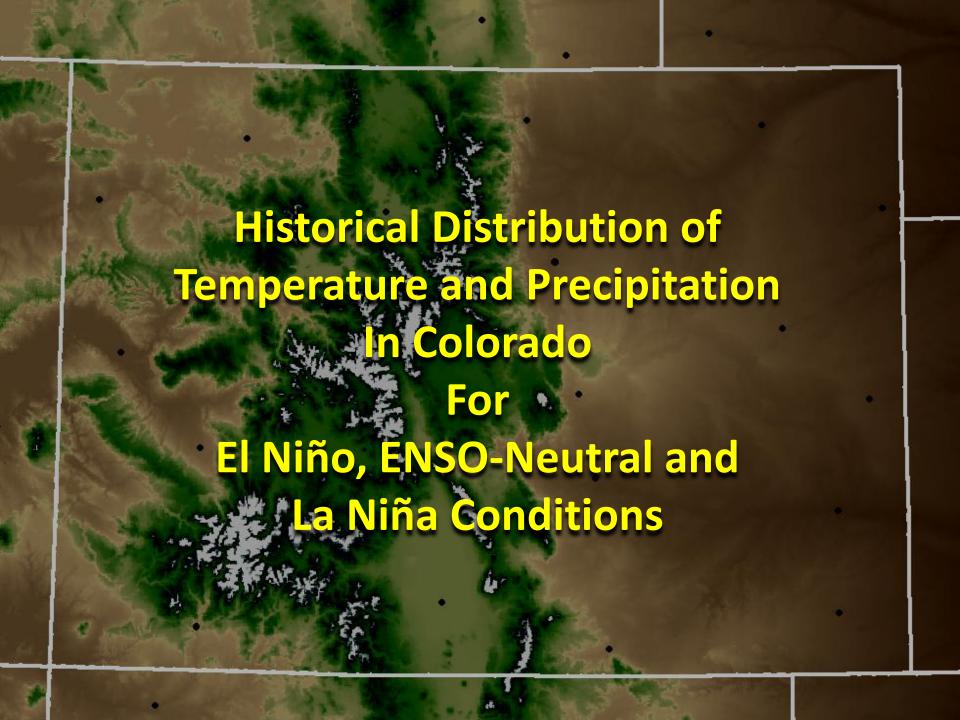


Lightning Frequency Along the Colorado Front Range

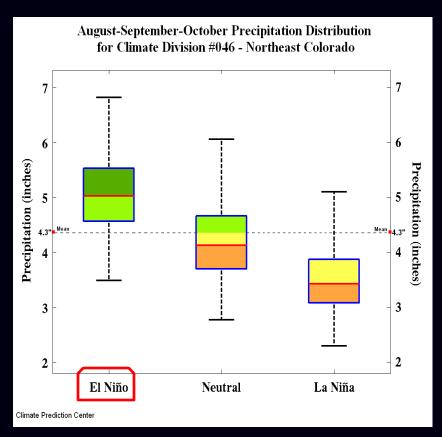
The occurrence of lightning in the Denver area and along the Colorado Front Range steadily increases during May and June, and peaks during July and August when thunderstorms are generally more prevalent.

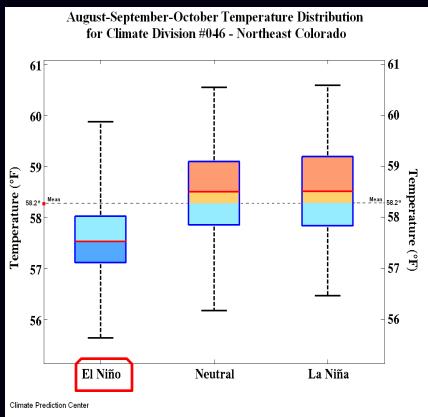
The occurrence of cloud-to-ground lightning peaks, on average, early in the afternoon with storms moving off the Front Range. As thunderstorms move out across the plains of northeast Colorado during the late afternoon and evening hours, lightning frequency generally decreases.

Not apparent on the lower graph is the up-surge in lightning flashes that often occurs in the Denver area during the mid-summer monsoon. These warm core thunderstorms are individually less likely to produce lightning than their spring counterparts, however their greater numbers increase the odds of seeing lightning especially during the evening hours.



ENSO Box and Whisker Analysis Plots for the Northeast Colorado Climate Division #046 for the 3-Month Climate Season August-October

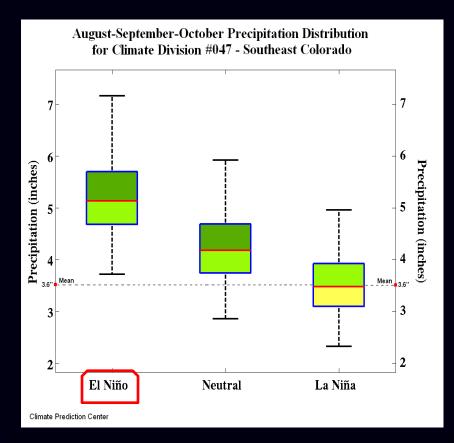


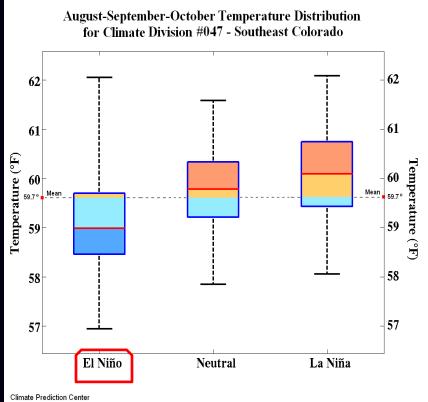


For the August, September and October climate season, precipitation in northeast Colorado has historically been *above average* during El Niños, slightly below average during ENSO-neutral conditions and below average during past La Niña episodes.

For the same three month season, temperature was *below average* during earlier El Niño events and slightly above average during ENSOneutral and La Niña conditions.

ENSO Box and Whisker Analysis Plots for the Southeast Colorado Climate Division #047 for the 3-Month Climate Season of August-October

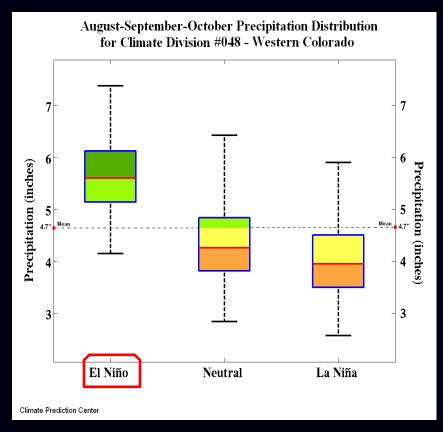




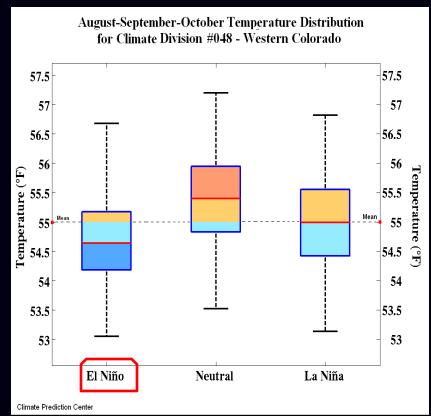
For the August-October climate season, precipitation in southeast Colorado has historically been *above average* during El Niño and ENSO-neutral conditions, and near average during past La Niña episodes.

For the same three month period, temperature was *slightly below average* during El Niño events and near average during ENSO-neutral and La Niña conditions.

ENSO Box and Whisker Analysis Plots for the Western Colorado Climate Division #048 for the 3-Month Climate Season of August-October

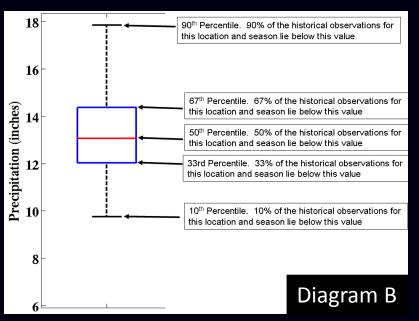


Finally, precipitation for western Colorado during the 3-month season of August, September and October, on average, was *above average* for El Niños, near average for ENSO-neutral conditions, and below average during La Niña events.



Temperature during this same 3-month season has historically been *slightly below average* during El Niños, slightly above average for ENSO-neutral conditions, and near average during La Niñas. Note, these distributions do not take into consideration the magnitude (weak, moderate, strong) of the ENSO event.

Colorado Climate Divisions Northeast Colorado Div. 046 Southeast Colorado Div. 047 Div. 099 Diagram A



Interpreting ENSO Box and Whisker Plots

Diagram A is a map of the four climate megadivisions in Colorado used by the Climate Prediction Center (CPC)—Divisions 046, 047,048 and 099.

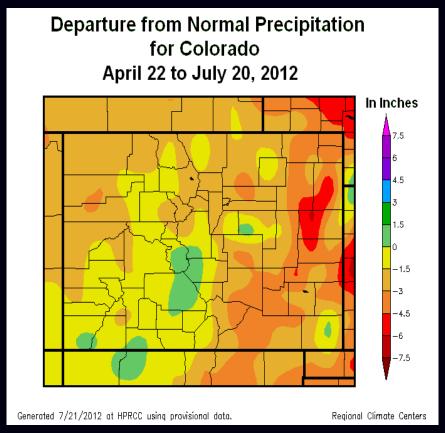
CPC has produced 3-month historical temperature and precipitation distribution plots for the three different ENSO categories —El Niño, La Niña and ENSO-neutral (non-ENSO) conditions for every climate mega-division in the United States.

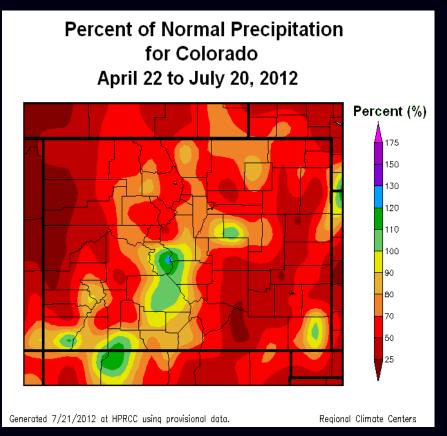
Diagram B is a description of the ENSO box and whisker analysis plot used by CPC to represent historical temperature and precipitation distributions for each ENSO category pertaining to each climate division.

The red line inside the ENSO box represents the mean or 50th percentile of the data (temperature or precipitation) distribution for each climate division. Approximately 34% of the total observations exist within the ENSO box, and the remaining observations (about 66%) lie outside of the box along the whiskers extending above and below the box.



During the 90-Day Period Ending July 20, 2012

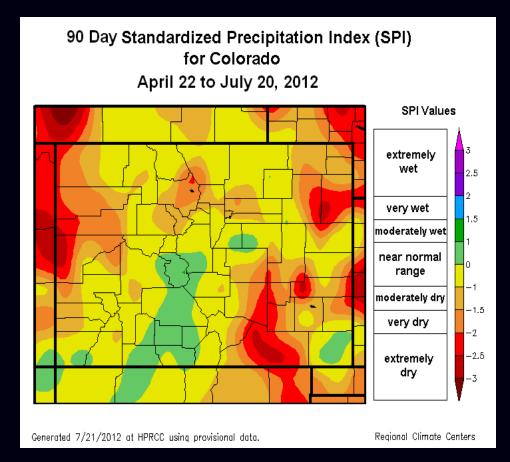




Precipitation during the 3-month period ending July 20th was generally below to much below average across Colorado. Precipitation totals were as much as 3 inches below average in northwest Colorado and nearly 6 inches below average in Kit Carson County in east central Colorado. These totals were little more than 25 percent of average for this period.

Scattered amongst all this dryness were pockets of above average precipitation, notably along the upper Arkansas River Valley near Salida where total rainfall was as much as 130 percent of average.

During the 90-Day Period Ending July 20, 2012

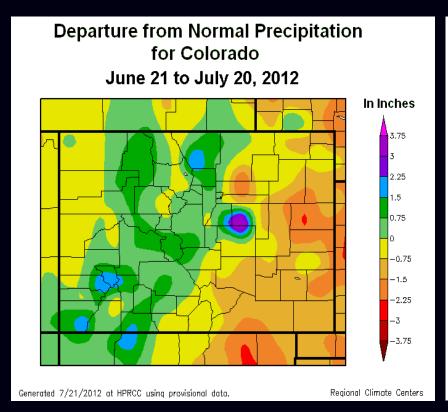


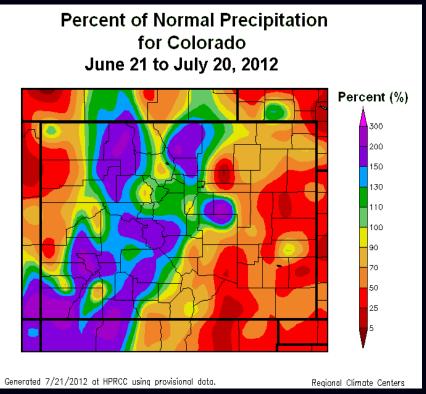
The Standardized Precipitation Index (SPI) for this same 90-day period, indicates moderate to very dry conditions across most of Colorado, with extremely dry soil conditions in the northwest part of the state, along the east slope of the Sangre de Cristo mountain range in southeast Colorado, and along the state's eastern border. Pockets of extreme dryness were also present in the northern Front Range mountains.

Recent rainfall has helped to return soil moisture levels to near average in the San Luis Valley of south central Colorado and in small areas along the state's southern border.

The SPI was developed to monitor potential short term agricultural and long-term hydrological drought conditions. The SPI is a probability index that considers <u>only</u> precipitation.

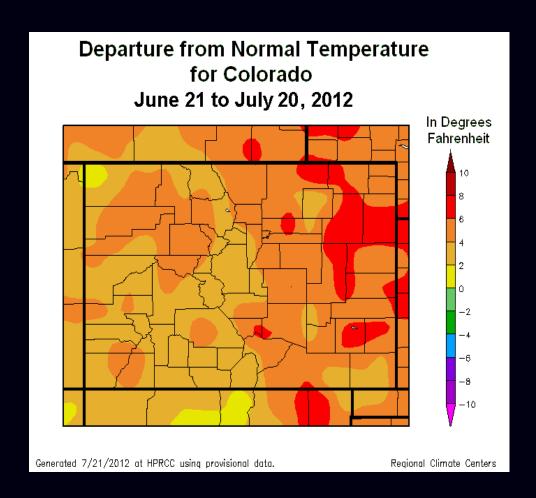
During the 30-Day Period Ending July 20, 2012





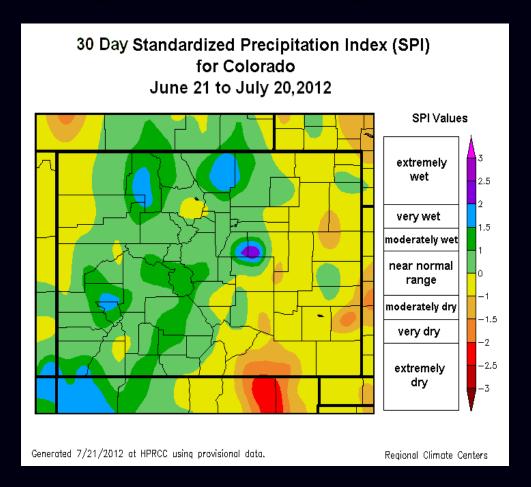
The southwest-to-northeast orientation of precipitation recorded across Colorado during the 30-day period ending July 20, 2012, reflects an increase in thunderstorm occurrence associated with the arrival of the southwest U.S. monsoon. With its brief appearance in early July, precipitation departures were replaced with surpluses, particularly in the mountains and high valleys along the Continental Divide. Above average precipitation is also indicated on the Palmer Divide in east central Colorado where moderate to heavy rainfall during the first weekend of July resulted in 30-day precipitation totals nearly 300 percent of average.

During the 30-Day Period Ending July 20, 2012



Temperatures during the 30-day period ending July 20, 2012 remained well above average, especially in eastern Colorado. It is in this area that temperatures were some 6 to 8 degrees (F) above average for this period of record. Nowhere in Colorado were temperatures below average, although they came close in the far northwest corner of the state.

During the 30-Day Period Ending July 20, 2012



The Standardized Precipitation Index (SPI) for the 30-day period ending July 20th indicates a general improvement in solid moistures across much of the state, particularly in the high country and adjacent high plains. Soils were extremely wet on the Palmer Divide in Douglas and Elbert Counties after heavy rainfall earlier in the month.

The SPI also indicated moderate to very dry soil conditions on the plains in southeast Colorado.

U.S. Drought Monitor

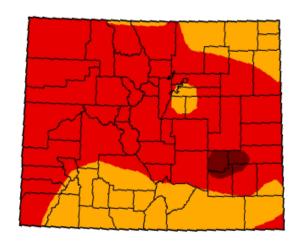
July 17, 2012

Valid 7 a.m. EST

Colorado

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	100.00	70.46	1.77
Last Week (07/10/2012 map)	0.00	100.00	100.00	99.98	70.46	5.52
3 Months Ago (04/17/2012 map)	5.17	94.83	59.85	25.93	0.00	0.00
Start of Calendar Year (12/27/2011 map)	67.79	32.21	24.98	14.94	0.04	0.00
Start of Water Year (09/27/2011 map)	60.62	39.38	27.69	19.99	7.88	0.56
One Year Ago (07/12/2011 map)	54.57	45.43	32.64	27.21	16.88	2.22



Intensity:





D3 Drought - Extreme



D4 Drought - Exceptional

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

http://droughtmonitor.unl.edu









Released Thursday, July 19, 2012 Richard Heim, National Climatic Data Center, NOAA

As of July 17, 2012, much of Colorado was experiencing extreme drought conditions (D3). This includes the northern Front Range urban corridor.

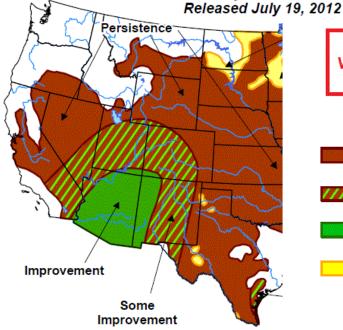
The U.S. Drought Monitor also indicated exceptional drought conditions (D4) along the Arkansas River in southeast Colorado.

Drought conditions were generally less severe across the northeast corner of the state and along the state's southern border.



U.S. Seasonal Drought Outlook Drought Tendency During the Valid Period Valid for July 19 - October 31, 2012





Close-Up of the Western Contiguous U.S.

KEY:

- Drought to persist or intensify
- Drought ongoing, some improvement
- Drought likely to improve, impacts ease
- Drought development likely

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events -- such as individual storms -- cannot be accurately forecast more than a few days in advance. Use caution for applications -- such as crops -- that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor. NOTE: the green improvement areas imply at least a 1-category improvement in the Drought Monitor intensity levels, but do not necessarily imply drought elimination.

The outlook for drought in Colorado for the period valid from July 19 to October 31, 2012 calls for the ongoing drought to improve some in western and southern portions of the state, with improvement likely for the far southwest corner.

For the remainder of Colorado, drought conditions are expected to persist or intensify during this period.

For an outlook for the entire U.S., go to www.cpc.ncep.noaa.gov/products/expert_assessment/season_drought.gif.

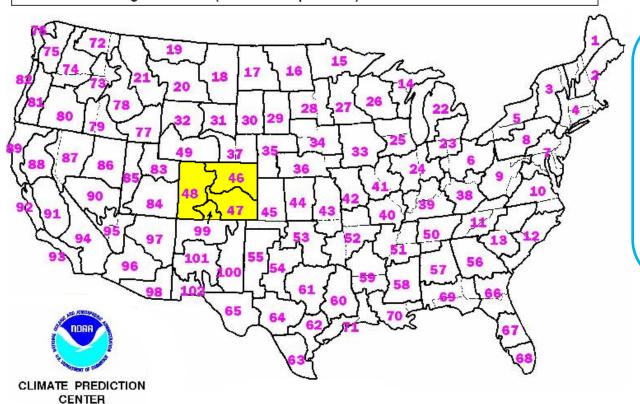
August-September-October 2012
Temperature and Precipitation
Outlook for Colorado
Issued by NOAA's
Climate Prediction Center

Climate Prediction Center Seasonal Outlooks

The National Weather Service Seasonal Climate Outlooks predict the probability of conditions being among the warmest/coldest or wettest/driest terciles of years compared to the period of record 1981-2010.

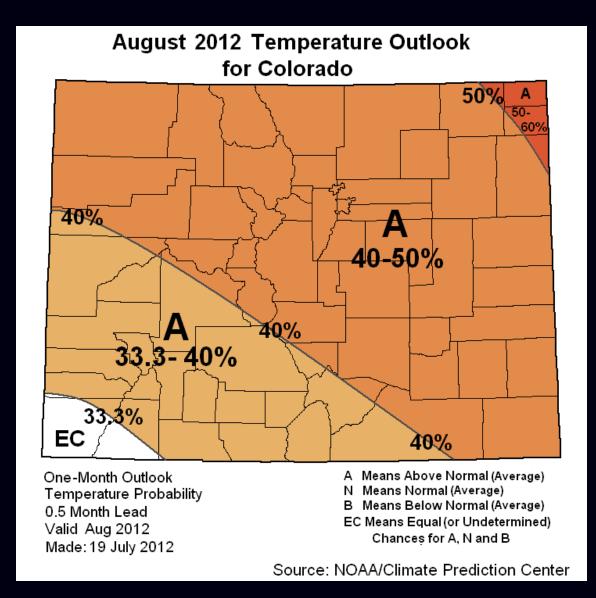
The outlooks indicate probability of being in three specific categories in reference to the 30-year climatology from 1981-2010. They are above, below and average.

Remember, Climate Predicition Center (CPC) outlooks are made at the scale of the climate megadividions (see the map below).



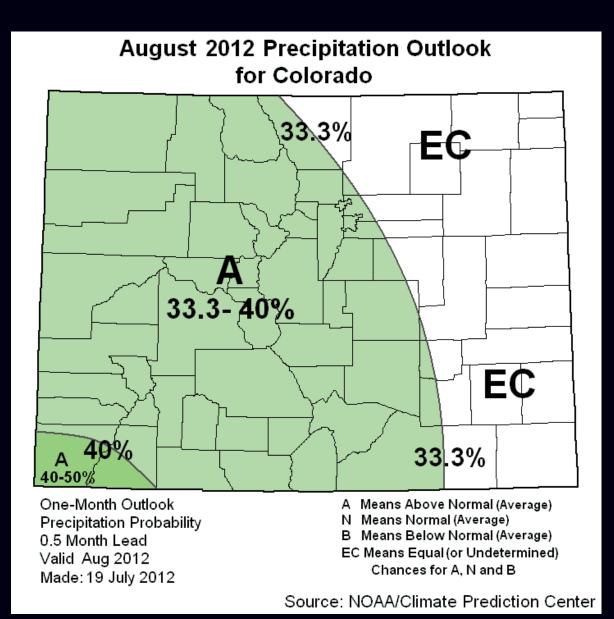
Remember:

CPC outlooks do not infer any degree of warmness or coldness, or any quantity of precipitation; *only* their probability of occurrence.



August 2012 Temperature Outlook for Colorado

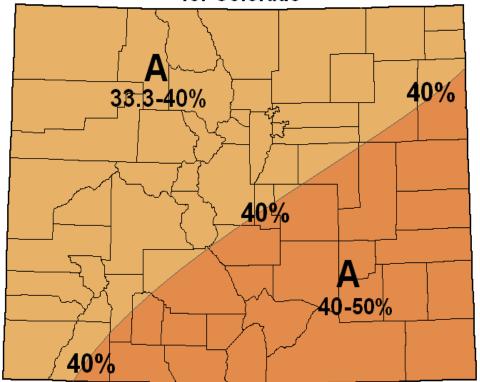
The temperature outlook for August 2012 from the Climate Prediction Center (CPC) calls for a 50 to 60 percent chance of above average temperatures across the extreme northeast corner of Colorado. The outlook also calls for a 33.3 to 50 percent chance of above average temperatures across the center of the state, and an equal or undeterminable chance for above, below and near average temperatures for the far southwest corner of Colorado (designated by the EC symbol).



August 2012 Precipitation Outlook for Colorado

The precipitation outlook for August from CPC calls for a 33.3 to 40 percent chance of above average precipitation for the western two-thirds of Colorado. This includes essentially all of the Front Range urban corridor. The outlook also calls for an equal or undetermined chance (EC) for above, below and near average precipitation for the remaining one-third of the state - the high plains of eastern Colorado.

August-September-October 2012 Temperature Outlook for Colorado



Three-Month Outlook Temperature Probability 0.5 Month Lead Valid ASO 2012

Made: 19 July 2012

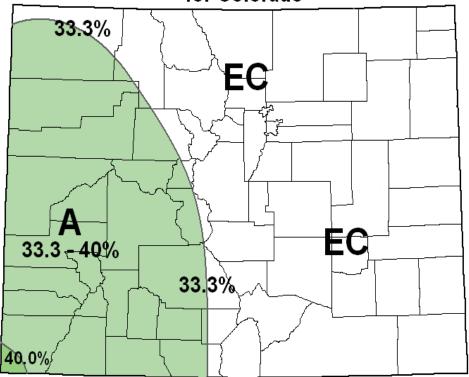
- A Means Above Normal (Average)
- N Means Normal (Average)
- B Means Below Normal (Average)
- EC Means Equal (or Undetermined) Chances for A, N and B

Source: NOAA/Climate Prediction Center

August-September-October 2012 **Temperature Outlook** for Colorado

The temperature outlook for the August-September-October climate season from CPC calls for a 33.3 to 40 percent chance of above average temperatures across northern and western portions of Colorado, which includes Denver and the northern Front Range urban corridor, and a 40 to 50 percent probability of above average temperatures for the remaining southeast corner of the state.

August-September-October 2012 Precipitation Outlook for Colorado



Three-Month Outlook Precipitation Probability 0.5 Month Lead Valid ASO 2012 Made: 19 July 2012

- A Means Above Normal (Average)
 N Means Normal (Average)
- N Means Relow Normal (Average)
- B Means Below Normal (Average)
- EC Means Equal (or Undetermined) Chances for A, N and B

Source: NOAA/Climate Prediction Center

August-SeptemberOctober 2012 Precipitation Outlook for Colorado

Finally, CPC's outlook for precipitation during the months of August, September and October 2012 calls for a 33.3 to 40 percent probability of above average precipitation for the western one-third of Colorado. This includes the San Juan Mountains and the western valleys. The outlook goes on to predict an equal or undetermined chance (EC) of above, below and near average precipitation for the remainder of Colorado.

Concluding Remarks

- 1. Oceanic and atmospheric conditions in the Pacific Ocean point to the development of El Niño this fall. ENSO probabilistic models indicate at least a weak El Niño by the August-October climate season. Dynamical models also indicate an El Nino of moderate strength by late this fall.
- 2. After a slow start to the southwest monsoon, these intermittent intrusions of moist and unstable air over Colorado the past couple of weeks have resulted in areas of flash flooding in and near the mountains. It appears from the latest observational and model information, together with the development of an El Niño, that the monsoon will be with us for several more weeks, although its intensity remains uncertain.
- 3. After the warmest June on record for the state of Colorado, temperatures continue to run well above average for the first half of July. An exception to this has been in the high country where monsoonal thunderstorms have brought some relief from the heat. The outlook is for a continuation of above average temperatures across Colorado through October with the best chance of above average temperatures on the eastern plains.
- 4. Severe to exceptional drought conditions across Colorado have eased some during July with a return of thunderstorms associated with the monsoon. The outlook calls for an improvement in the drought on the west slope and little change east of the Continental Divide through at least September.